RECENT ADVANCES in SIGNAL PROCESSING, ROBOTICS and AUTOMATION

Cambridge, UK, February 21-23, 2009

Proceedings of the 8th WSEAS International Conference on SIGNAL PROCESSING, ROBOTICS and AUTOMATION (ISPRA '09)

Mathematics and Computers in Science and Engineering
A Series of Reference Books and Textbooks

ISBN: 978-960-474-054-3
ISSN: 1790-5117

Published by WSEAS Press
www.wseas.org

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World Scientific and Engineering Academy and Society

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Preface

This year the 8th WSEAS International Conference on SIGNAL PROCESSING, ROBOTICS and AUTOMATION (ISPRA '09) was held in the University of Cambridge. The Conference remains faithful to its original idea of providing a platform to discuss theoretical and applicative aspects of nonlinear signals and systems, multirate filtering and filter banks, cyclostationary signal analysis, speech production and perception, kinematics, dynamics and control of robots, discrete event dynamics systems, circuits and electronics for control, intelligent control, human-machine systems and cybernetics, control in business, management and economics etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

During this last year we witnessed the growth of the European Union interest in Robotics and Automation. This is an additional proof that they are seen not only as an exciting research area but also as technologies that may solve current European citizens' concerns with several practical problems.

For a discipline which is central to research and also to industry and which generates interests not only among academicians but also among large companies and government departments and agencies, it is important to look at the market and at its movements.

A Conference such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors

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Plenary Lecture 1

On Some Properties of Fuzzy Systems

Professor Constantin Volosencu
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Abstract: The paper presents a short review of some main properties of fuzzy systems useful in control. Fuzzy rule bases and fuzzy systems may be seen as applications between real or fuzzy sets. They have algebraic properties as commutative law, neutral element and symmetric elements. The fuzzy systems, implemented using different rule bases, fuzzy values, membership functions, fuzzyfication and defuzzification methods have sector property. The paper is emphasising a spatial sector property, useful in stability analysis with Lyapunov techniques. The fuzzy systems may be characterised with SISO and MIMO transfer characteristics. These transfer characteristics are used in the pseudo-equivalence of the fuzzy PI controllers with linear PI controllers. The paper presents a way to use translated SISO transfer characteristics and gain characteristics of fuzzy blocks in the design of fuzzy control systems and stability analysis. Based on transient characteristics of fuzzy control systems some quality criteria are presented.

Brief Biography of the Speaker: Prof. Constantin Volosencu graduated in 1981 the Faculty of Electrotechnics, "Traian Vuia" Polytechnic Institute of Timisoara, Romania, as an engineer in automatics and computers and he is doctor in control systems at "Politehnica" University of Timisoara. In present he is professor at "Politehnica" University of Timisoara, Faculty of Automatics and Computers, Department of Automatics and Applied Informatics. His research interest is in linear control systems, fuzzy control, neural networks, control of electrical drives, modelling, simulation, identification and sensor networks. He is author of 9 books and more then 100 scientific papers, published at international conferences and journals. He was manager of over 30 national an international research projects.
Constantin Volosencu worked from 1981 to 1990 at "Electrotimis" Enterprise Timisoara, in the field of the control systems for industrial machines, where he developed control equipments for a large scale of machineries, which are the objects of 27 patents.

Plenary Lecture 2

Safety, Uncertainty, and Real-Time Problems in Developing Autonomous Robots

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Abstract: Recent developments in robotics outside traditional industrial applications increasingly focus on operation of robots in an unstructured environment and human vs. robot interactions. Examples of new applications of robots in unstructured environments that are actively pursued today are personal and service robotics, space and underwater robotics, medical and rehabilitation robotics, construction robotics, and agriculture robotics. The new trends in robotics research have a general goal of getting robots closer to human social needs. In this case a key problem of robotics is the problem of safety of robot and its surrounding. For safe autonomous functioning in a dynamic unstructured environment, a robot should possess a capability of real-time data processing under information uncertainty. These three issues - safety, uncertainty, and real-time data processing are closely related: planning safe actions based on uncertain data usually requires more computation than planning without uncertainty because multiple possible outcomes of actions should be considered. The main sources of the uncertainty are inaccuracy of sensorial data measurement, time-delay of sensorial data acquisition and processing, and time-delayed feedback in a robot's control system. As increase of accuracy of measurements and speed of data processing has technical and economic restrictions, there is a necessity for search of practical decisions in the conditions of existing possibilities. We propose a method of real-time data processing under information uncertainty that deals with different acceptable levels of uncertainty and collaborative processing of various data, visual and non-visual. Finally we present the examples of application of the proposed method for building of robot's environment model and for robot motion planning with obstacles avoiding.

Brief Biography of the Speaker: Vitaliy Rybak received the Diploma in radio-physics from the Kiev State University, Ukraine, 1958, and Ph. D. degree in Technical Cybernetics from the Institute of Cybernetics of the Academy of Sciences of Ukraine, 1968.
Since 1958 till 2000 he was with the Institute of Cybernetics of the Academy of Sciences of Ukraine. From 1975 to 2000 he was the scientific director of the National Scientific Seminar of Ukraine "Scientific and Engineering Problems of Robotics". From 1982 to 2000 he was the head of Department of Informatics in Robotics of the Institute of Cybernetics of the Academy of Sciences of Ukraine. From 1989 to 2000 he was the director of the Section of Robotics of the Scientific Council of the Automation of the National Academy of Sciences of Ukraine. From 2000 till now he is a professor of the Technological University of the Mixteca, Mexico; director of the Laboratory of Robotics of the same university.
His major research interests include Intelligent Robotics (autonomous robot architecture, 3D robotics vision, 3D stereo measurement, 3D object recognition and scene analysis, goal directed robot's behavior planning), Image Processing, and Pattern Recognition.
He has published the book and more than 140 papers in Intelligent Robotics, Image Processing, and Pattern Recognition. He was the responsible editor of 13 books in Artificial Intelligence, Intelligent Robotics, Image Processing, and Pattern Recognition. He was the director of numerous international and national research projects in Image Processing, Pattern Recognition, and Intelligent Robotics.
He is the winner of the National award in the field of science and technology of Ukraine, 1993.

Plenary Lecture 3

Signal Processing – Key Element in Designing an Accurate Machining Forces Measuring Device

Associate Professor Mihaiela Iliescu
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Abstract: When manufacturing parts, specially by machining process, it is often necessary to have reliable information on machining forces involved. So, systems and devices for measuring these forces have to be used, this paper presenting an innovative one, which, has also been patented. One of the most important aspects in designing such a device is represented by good signal processing, so that, for instance, specific calibrating equations to be appropriate determined. Checking obtained results into real machining conditions represents a final challenge.

Brief Biography of the Speaker: Has graduated in 1989, "POLITEHNICA" Institute of Bucharest, ROMANIA and in1989 – 1991 worked as an engineer – in the Design Department of a Romanian peripheral equipment factory, FEPER.
Since 1991 has been working, as a teacher in "POLITEHNICA" University of Bucharest, ROMANIA – Manufacturing Department, in 2004, being Associate professor. The Doctoral Thesis, in 2000 – was on Quality and Machinability of Thermal Sprayed Layers.
Teaches courses and works into the fields of: Applied Statistics for Engineers; Metal Forming; Manufacturing Technologies; Injection Moulding, being scientific researcher, in about 30 Research Projects and Grants. First-author or, co-author, of about 95 studies and papers - published to International/National Conferences, Sessions, Workshops, Platform Meetings etc; of 12 books on Statistics, Manufacturing Technology, Geometrical Precision Inspection. Member of some professional associations, as Plastics Industry Producers Association – ASPAPLAST, ROMANIA, Rapid Manufacturing Association – RAPIMAN; has some international awards as: Best Innovation Award - at Brussels INNOVA Fair, 2007, Golden Medal – in INVENTIKA –2008, Bucharest, Romania.
Has papers presented in WSEAS Conferences, in 2008 and, also published in WSEAS Journals. Has done organizing activities for WSEAS Conferences in Bucharest, in June and, specially, in November, 2008.

Plenary Lecture 4

Flexible Superfinishing Modules used in SME (Small and Medium Enterprises)

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Abstract: In the paper are presented some achievements regarding the uses of flexible superfinishing modules that can be used to obtain the surface finish requirements for the products in small and medium enterprises. These modules have a range of flexibility that make them to adapt to a large sort of products and to a great range shape and dimensions of workpieces.

Brief Biography of the Speaker: Badea Lepadatescu
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Work experience: 1998 to present – Assoc. Prof at Transilvania University of Brasov
1982-1998 - Research engineer at transilvania University of Brasov
1976-1982 – Design engineer at ROMAN truck factory in Braosv.

Plenary Lecture 5

Real-time Fuzzy Digital Filters: Basic Concepts

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Abstract: The Real-time Fuzzy Digital Filters (RTFDF) concepts considering the fuzzy logic description, adaptive digital filters and Real-time constrains. The main characteristic operation of this class of filters is bounded by a region knew as linguistic natural knowledge base including all possible combinations results. Illustratively speaking, the computational output signals system classified with respect to desired answers in linguistic natural form, requiring to establish the membership function set due to natural computational interaction respect to linguistic output communication. The RTFDF requires a rules group inside of the knowledge base, typically described by logic connectors; considering the quality answers into natural languages, and the interaction constrains with adaptive properties. The basic results will be described in formal sense, using definitions, considering Nyquist, Shannon, Zadeh and Passino criteria into convolution filter scheme.

Brief Biography of the Speaker: Prof. Jesus Medel graduated in 1994 the Faculty of Aeronautic, National Polytechnic Institute (NPI) Mexico, as an engineer in aeronautics and he is master and doctor in automatic control systems at Advanced Research Center into National Polytechnic Institute. In present he is full time professor into Computer Research Center in the same institution, Department of Real Time Control. His research interest is about the identification theory with intelligent and formal descriptions, without lost the stochastic natural descriptions systems. He is author of 4 books related with these topics and more than 50 scientific papers, published at international conferences and journals.
Jesus Medel, is a member of Mexican Academy of Sciences and National Research System, having different national awards as the best Doctoral Thesis advisor, Furthermore, works from 1999 to 2009 at Identification systems in many varieties for stochastic basic model descriptions.

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